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# The Housing Shortage and the Supply of Building Materials

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THE United States is over a year behind schedule in her building operations! It would be necessary to double the output of building materials and new homes in a single year in order to make good this building deficit. The physical supply of basic raw materials is amply sufficient for the most ambitious housing program, but the high cost of construction in proportion to the returns is checking a building boom that would otherwise quickly fill the vacuum! These are the main head lines of the building situation in the United States in the year 1920.

## THE HOUSING SHORTAGE

### *Decline in Building*

The housing shortage is the natural result of the decline in building that began with our entry into the war in 1917 and that continued until the latter part of 1919. The government war-building program of \$1,500,000,000 did partially offset the decline in private building, but the construction of cantonments and other structures for military purposes contributed little to the maintenance of the peace establishment, and hence may be ignored in this discussion. We are confronted today with a housing shortage that is reflected in daily appeals for more homes, high rents, over-crowding, plans to build portable houses, and official conferences to stimulate building. Although the lack of dwellings is becom-

ing an acute want, this building deficit cannot be measured in exact terms. The number of new houses needed cannot be computed by taking a census of the homeless, because the "shortage" has not been great enough to force many American householders to sleep in the parks; it has merely crowded the nation into closer quarters—into fewer rooms and into dark tenements that were normally vacant.

The best light on the extent of the building vacuum can be obtained by computing to what extent the building in the last three years has fallen short of the building in three normal building years. Assuming that our population and building needs have increased during the last three years at a normal rate, the housing shortage will then be shown by the amount by which the actual building operations of 1917, 1918 and 1919 have failed to keep pace with this normal demand. Even this method of computing the housing shortage will bring us to only approximate conclusions.

The final estimate of the housing shortage must be compounded from two other estimates, in each of which lurk the chance of error. First, in the absence of any official census of the total number of buildings in the United States and the total amount of annual building in the nation, we must rely upon the official statistics of the *United States Geological Survey* which cover

building operations in the leading cities only. These statistics, while excellent for a comparative study of building in cities, might not show the trend of new construction in the country districts. The writer believes, however, that the statistics of the *United States Geological Survey* may be taken as representative of building in the entire nation—city as well as country—because the main variations in the amount of building during the war were caused by congestion of war work in certain sections of the country and not to any difference between urban and rural districts. Thus the building shortage was acute along the Atlantic seaboard in both city and country districts while building activities were almost normal in some of the city and country districts of the south and west. Since the building statistics of the *United States Geological Survey* include cities in all sections of the nation, it is believed that they represent a fair average of building operations. These statistics do not include construction for military purposes, for which no permit was required, but such building should properly be excluded from a discussion of normal building.

Secondly, since the building statistics of the *United States Geological Survey* do not show the actual number of houses, but only the value of the building permits, allowance must be made for the increased value of permits that was due entirely to the change in the price level since 1914. In other words, comparative statistics for the last four or five years in terms of dollars are misleading, because it takes more dollars in 1919 than it did in 1913 to represent the same physical volume of building. Yet physical volume of

building is what we must determine in dealing with a housing shortage, for a house that costs \$5,000 today will not shelter as many as two houses built of the same materials four years ago at a cost of \$2,500 each.

#### INCREASED BUILDING COSTS

How shall we weight the value of permits to allow for increased building costs? The average prices of twenty-nine leading building materials, computed by the Price Section of the War Industries Board,<sup>1</sup> had advanced 37 per cent over their pre-war average (fiscal year ending June 30, 1914) by the end of 1916, 69 per cent by the end of 1917, and 92 per cent by the end of 1918. The prices of building materials of the Bureau of Labor show that the advance had reached 136 per cent by November, 1919.

The cost of building probably has not advanced as much as the prices of building materials, however, because the wages of building labor did not respond as quickly as other wages to the upward price movement. The Division of Public Works of the United States Department of Labor has made an estimate of the increased cost of building since 1914, which includes the average costs of all types of buildings. These figures will be used to discount the value figures of the *United States Geological Survey*.

Taking the value of building permits for the year 1913 as equal to normal for the country or par of 100 and also putting the building costs of that year as equal to 100, we can thus compute the decline in building that has occurred since 1917:

<sup>1</sup> Prices of Building Materials, 1919. Bulletin No. 6.

	Value of Permits <sup>2</sup> (in 143 to 151 Cities)	Weight for Cost of Building <sup>3</sup>	Estimated Building Operations for the en- tire United States	Deficit in Build- ing for the entire United States
			Per Cent Normal	PerCent Normal
1913	\$859,657,250	100 <sup>5</sup>	100	0
1914	785,525,746	100	..	..
1915	799,735,860	100	..	..
1916	1,024,211,675	117	..	..
1917	687,415,605	139	60	40
1918	430,014,365	159	31	69
1919	1,281,000,000 <sup>4</sup>	200 <sup>5</sup>	75	25
Accumulated deficit				134

<sup>2</sup> *United States Geological Survey.*

<sup>3</sup> United States Department of Labor, Division of Public Works: *Economics of Construction Industry*, p. 87.

<sup>4</sup> United States Chamber of Commerce.

<sup>5</sup> Estimated.

Thus the housing shortage is equal to one and a third years of normal building. While this estimate is only an approximation, it is a minimum estimate of the building shortage. If prices of building materials, as computed by the Price Section of the War Industries Board, were used to indicate the rise in the cost of building, the accumulated deficit would be 167 per cent or one and two-thirds years of normal building. The average shortage of buildings for the country as a whole is probably equivalent to slightly more than the amount erected in a normal year, because, as we shall see later, the production of leading building materials is also about a year in arrears.

Other estimates of the housing shortage have been made in terms of the number of houses. The Forest Service estimates that we lack 450,000 houses. Other authorities place it as

high as 800,000 or 1,000,000. In view of the wide variation between the size and cost of small frame cottages, rooms in family hotels, apartments, tenements, etc., it is hard to define any standard "house" as a unit of measure. We shall therefore content ourselves with the estimate of the housing shortage in the terms already given, namely, that we lack slightly more than the number of buildings that were finished in a normal year.

### SUPPLY OF BUILDING MATERIALS

What is the supply of building materials that is available to meet the deficit caused by the lack of over a year's building? If it were necessary to take an exhaustive inventory of all the hundreds of kinds of raw and partly finished building materials, such as cement blocks, door knobs, metal lath, in-a-door beds, plasterboard, flooring, finished doors, window sashes, etc., we would have tables of statistics sufficient to fill this entire volume. But such an elaborate stock-taking is not required because it would prove little even if prepared. Building materials are produced as they are needed; the supply is forthcoming when there is evidence of a demand. Building materials are not grown like annual crops and stacked up in warehouses to be sold to the highest bidder. Consequently, the quantity of finished building materials, now on the shelves of dealers, has little bearing on the quantity that could be produced if a building boom stimulated production.

We need only look to the amount of standing timber, the quantity of cement rock, the volume of common clay, the deposits of limestone and iron ore. Mother Earth is the primary

source of our building materials. If her cupboard is well-stocked, it will take only time, labor, and plant capacity to bring forth all the buildings we need. It can safely be said that the supply of these basic materials is sufficient for all housing requirements that will arise now and for many years to come. There is an almost unlimited supply of clay for the making of common brick, cement rock is almost equally abundant, the coal for burning clay into brick and cement rock into cement will last a century at least, the iron ore for structural steel, metal lath, hardware, etc., will not be exhausted within the lifetime of the unborn children of our unborn children; lumber is beginning to show signs of exhaustion, but we need not worry about the lack of lumber for any building needs that will come within the next ten years. The supply of basic raw materials is thus sufficient to double, if not to triple, the output of buildings in a single year.

What labor and plant capacity is available to work up this added supply of raw materials? It has been estimated that there is an excess plant capacity of 50 per cent in the lumber industry; there is a like excess capacity in the case of cement, brick and stone, while the steel mills could easily produce more structural steel by the curtailment of other steel products. If the building demand is important enough to attract labor from other industries, labor can be supplied in sufficient amounts for all the unskilled work. Even enough skilled bricklayers, carpenters, etc., could probably be found if the abnormally large building operations were distributed evenly over the year and

not piled up in one peak load. Thus demand for building would start the ball a-rolling that would pile up sufficient building materials by the end of this year to enable us to do two years' building in the one year of 1921.

### *Cost of Building Materials*

But demand for building—aye, there's the rub. What contractors will put up buildings at double the 1914 costs, when rents are not allowed to advance to cover this increased cost of building? Who will erect a house which is only a little newer and a little better than one costing just half as much? The majority of people still have hopes that prices will come down and as long as they feel that way they are loathe to invest in permanent structures at high cost that may later be matched by equally good structures at much lower costs when prices come down. Thus the high cost of building materials is the cause of the contraction of building activities. Since that high cost is primarily due to the high wages paid to labor in the building industries, such high cost will not fall much with increased production. The raw materials exist in abundance, but it takes labor to fabricate them into buildings, and this labor is very expensive. Herein lies the kernel of the problem.

### PRODUCTION OF LEADING BUILDING MATERIALS

The extent to which the production of building materials and likewise the demand for building materials has fallen off during the last three years may be observed by a study of three leading building materials: lumber, cement, and common brick. By taking

the physical production of each of these basic materials during the last three years and comparing the production during these years with that of a normal year, we can ascertain the amount of the deficit in the case of each one.

### *Lumber*

The normal annual lumber production of the United States is about 40 billion board feet. Allowances must be made, however, for the fact that the lumber consumption in this country is declining and also for the excess of exports over imports which amounted to two billion feet a year before the war. The normal consumption of lumber in this country would therefore not exceed 38 billion feet. Since there has been practically no surplus of lumber exports over imports during the last three years, the entire production was consumed in this country during those years. Taking 38 billion board feet as the normal production of lumber, the lumber deficit is shown by the following table:

Year	Lumber Production M Board Ft. <sup>6</sup>	Deficit M Board Ft.
1913	38,387,000	
1914	37,346,023	
1915	37,001,656	
1916	39,807,251	
1917	35,831,239	2,200,000
1918	32,700,000	5,300,000
1919	33,500,000 <sup>7</sup>	4,500,000
Accumulated deficit		12,000,000

To this deficit of 12 billion board feet must be added the six billion board feet that were used for cantonments, airplane stock, etc., which contributed practically nothing to normal building. This would make a total lumber

deficit of 18 billion feet or about one-half of the annual lumber cut. Since it is estimated that only about one-half of the lumber cut is used directly for houses and building, this lumber deficit is equal to the amount of lumber that goes into building in a single year. Of course it cannot be assumed that the lumber deficit is building lumber exclusively, for during the war there was a falling off in the consumption of lumber for making furniture, box cars, and many other articles besides houses. Nevertheless, a lumber production of 60 billion feet in a single year would be required to make good the deficit of wooden houses and other wooden articles. The supply of standing timber and plant capacity in the lumber industry is easily adequate for this task, but high lumber prices will prevent such a heavy demand from accruing in one year.

### *Cement*

In 1913 cement production exceeded all previous records with over 92,000,000 barrels, but this mark was again surpassed in 1917 when the figures reached almost 93,000,000 barrels. Since cement production has been continually increasing in normal years, it is fair to take 92,000,000 as a basis for computing the deficit. The cement shortage is then shown by the following table:

Year	Production (Barrels)	Deficit (Barrels)
1913	92,097,131	
1914	88,230,170	
1915	85,914,907	
1916	91,521,198	
1917	92,814,202	
1918	71,081,663	21,000,000
1919	80,287,000	12,000,000
Accumulated deficit		33,000,000

<sup>6</sup> United States Forest Service.

<sup>7</sup> Estimated.

To this deficit of 33,000,000 barrels must be added the 11,000,000 barrels used for military purposes, making a total cement deficit of 44,000,000 barrels. To wipe out this accumulated shortage in a single year would require a cement production of 135,000,000 barrels. While the raw materials and plant capacity are capable of furnishing this amount, the demand for that amount of cement is not likely to develop in a single year. An increase in cement production at a rate more rapid than other building materials is to be expected, however, in view of the relative cheapness of cement.

### *Common Brick*

Common brick production and consumption has been declining so that although production reached eight billion brick in 1913, the normal average is probably not over seven billion brick. Allowing seven billion brick as the normal production, we find the following common brick deficit:

Year	Production <sup>8</sup> M Brick	Deficit M Brick
1913	8,088,790	
1914	7,146,571	
1915	6,851,099	
1916	7,394,202	
1917	5,864,909	1,100,000
1918	3,556,519	3,400,000
1919	4,500,000 <sup>9</sup>	2,500,000
Accumulated deficit		7,000,000

Since very little common brick was used for military purposes, the net deficit remains at about seven billion brick or an amount equivalent to one year's production. To catch up with present and deferred building needs a common brick production of 14 billion brick, would be required but such

a production is not likely to be demanded in a single year.

Thus, the shortage in the production of three leading building materials is about equal to the amount of each of these materials consumed in building in a normal year. Only part of the cement and lumber production being used for building, a 50 per cent increase in the annual production of these materials would fill the building vacuum. Since all of the common brick is consumed in building, the deficit is equal to 100 per cent of one year's production. The curtailment of brick buildings during the war was also more marked than in the case of lumber and cement structures; so there is a greater real deficit in the case of common brick.

### CONCLUSION

The so-called building deficit might conceivably never be entirely met. With the cost of building materials today 135 per cent higher than the pre-war level, space will be economized to a greater extent than when buildings were cheaper. In the pre-war days there were always the unoccupied "marginal" houses, the dark apartments that were seldom if ever rented, the extra bed-room for guests, the inside hotel rooms for which people seldom registered, the cheap lodging houses that were never filled to capacity. The scarcity of buildings has forced families to accept the dark apartments they formerly passed by with disdain; lack of hotel accommodations compels the late-comer to sleep in the parlor or in a boiler room; some families give up their "extra" rooms to roomers, while other families dispossess of their homes and confine them-

<sup>8</sup> *United States Geological Survey.*

<sup>9</sup> Estimated.

selves in small furnished apartments. The higher cost of space will cause the nation to crowd into closer quarters, because it cannot afford to spread out and maintain as many vacant rooms as formerly. We will neither have as much space or as many new buildings if the costs of building continue to rise. Old buildings that would be torn down when new buildings were cheap will be patched and preserved for further service when a new building is a luxury.

Factory building will proceed regardless of construction costs. The expense of the factory building is only a small fraction of the cost of the finished product and, when expanding sales require a larger factory, buildings must be erected or the profit on the increased sales will be lost. The opportunity to crowd factories into smaller buildings and to economize space is not as great as in the case of private dwellings, for factory space has already been economized as much as possible to save heat, light, insurance, ground rent and interest. Neverthe-

less, the higher cost of building may put a further premium on night shifts.

In the course of time, however, building will probably resume normal proportions whether prices remain where they are or whether prices fall. A financial depression and a fall in the prices of building materials will, of course, stimulate a rush of new building. On the other hand, if prices remain where they are, the depreciation of the dollar will gradually become a commonly accepted fact. People will cease to object to paying twice as much rent when new buildings are erected at twice the cost of old buildings, and when they receive twice as large an income. When the prices of everything have advanced to a new level and the adjustment is complete, a dollar spent for building will go as far as a dollar spent for anything else. Then the nation will expand into its more commodious quarters again. Under any view of the situation, a great number of new buildings looms on the horizon.